(No Model.)

W. J. STILL.

TRANSMUTER FOR ELECTRICAL CURRENTS.

No. 531,657. Patented Jan. 1, 1895.

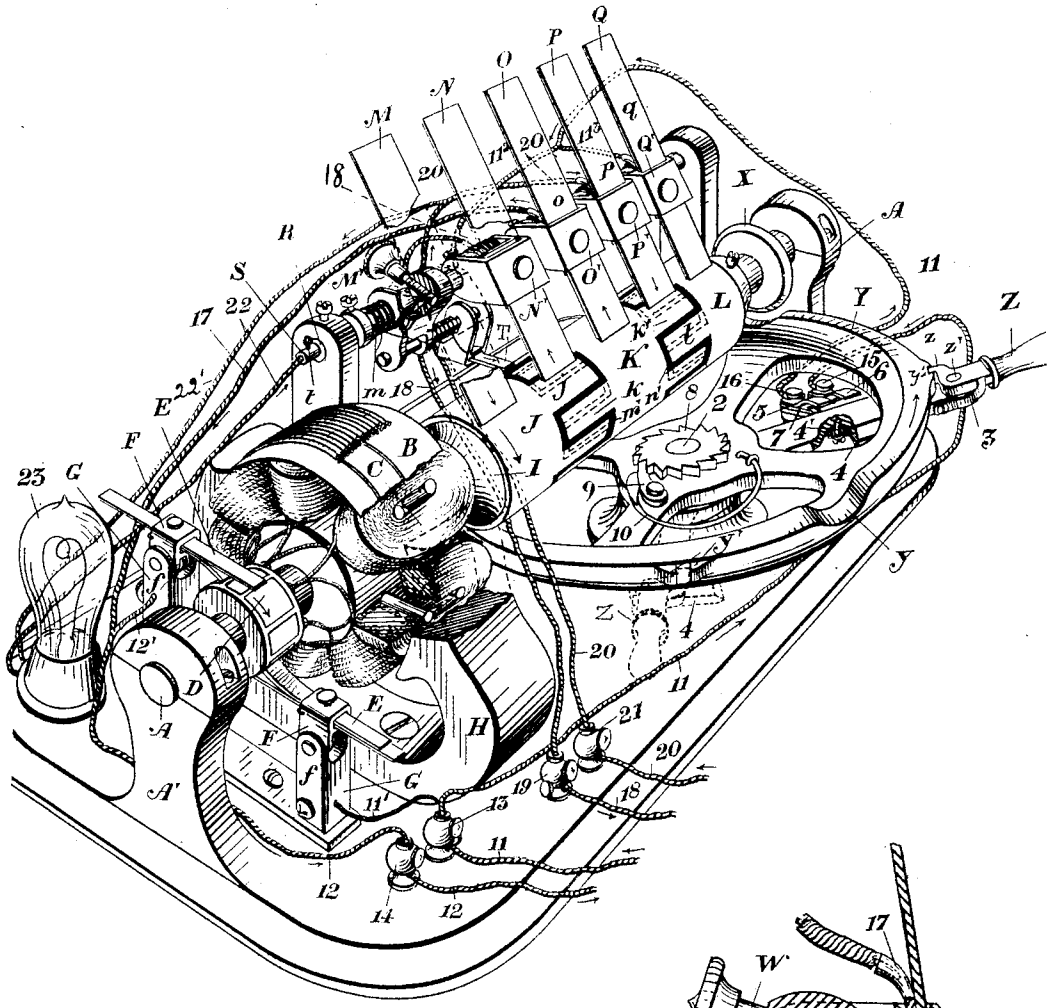

Fig. 1.

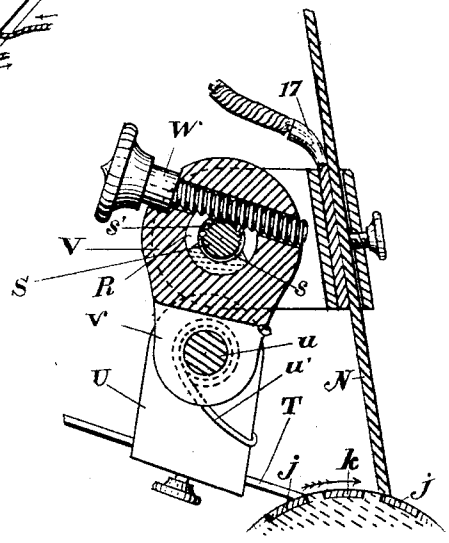

Fig. 2.

Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM JOSEPH STILL, OF TORONTO, CANADA, ASSIGNOR OF ONE-HALF TO RANDOLPH MACDONALD, TRUSTEE, OF SAME PLACE.

TRANSMUTER FOR ELECTRICAL CURRENTS.

SPECIFICATION forming part of Letters Patent No. 531,657, dated January 1, 1895.

Application filed April 5, 1893. Serial No. 469,131. (No model.) Patented in Canada June 28, 1893, No. 43,408.

To all whom it may concern:

Be it known that I, WILLIAM JOSEPH STILL, electrician, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improved Transmuters for Electrical Currents, of which the following is a specification.

This invention has been patented to me in Canada under date of June 28, 1893, No. 43,408.

My invention relates to the transmuting or changing of alternating current to a constant or continuous current and the object of the invention is to produce an instrument by which an alternating current may be transmuted into a steady or constant current for power purposes or for the charging of accumulators and it consists essentially of securing on a shaft a cylinder of insulating material around which is secured metal rings with lateral toothed projections which are arranged to coact with a series of brushes by which the alternating current is changed to a constant current, the cylinder being rotated by a motor arranged in a fixed relation to the transmuting cylinder and the whole being constructed in detail and arranged to operate as hereinafter more particularly explained.

Figure 1, is a perspective view of my transmuter. Fig. 2, is a sectional detail showing the means for adjusting the short circuiting brush on the transmuting cylinder.

In the drawings like letters and figures of reference indicate corresponding parts in each figure.

My invention is more particularly designed for the transmuting or changing of an alternating current to a constant current where it is necessary to have such changing done at such a distance from the generator that it would be impossible to connect the generator with the transmuter by any mechanical means.

A, is the main driving spindle journaled at each end in the bearing standards, A′. At one end of the spindle, A, is situated a motor, the armature, B, of which is composed of the coils, C, of fine wires which are connected in the usual manner to the commutator, D, secured on the spindle, A.

E, are the brushes which are secured in the holders, F, pivotally attached to the vertical posts, G. The brushes, E, are held against the commutator, D, by the usual spiral springs *f*, secured in the holder, F.

H, are field magnets within which rotate the armature, B.

I, is a cylinder of insulating material secured on the opposite end of the spindle, A.

J, K, and L, are metal rings which are secured on the cylinder I. The rings, J, and L, have lateral rectangular toothed projections, *j*, and *l*, which extend inwardly. The projections, *j*, and *l*, are alternately arranged on the cylinder, the spaces between the projections, *j*, being opposite the projections, *l*, and the spaces between the projections, *l*, being opposite the projections, *j*. The metal ring, K, has outwardly extending lateral projections, *k*, *k′*, on each side alternately arranged and extending into the spaces between the projections, *j*, and *l*, respectively. Into the spaces between the projections, *k*, *k′*, on each side of the ring, K, extend the projections, *j*, and *l*, respectively. The projections, *j*, in the ring, J, the projections, *l*, in the ring, L, and the projections, *k*, *k′*, in the ring, K, are each of the same width, such width being less than the spaces between the projections. The projections in each case also do not extend to the end of the spaces between the projections on the adjacent rings. It will consequently be seen that there are strips, *m*, and *n*, of insulating material extending around the edges of the projections between the rings, J, and K, K, and L, respectively.

M, N, O, P, and Q, are brushes secured in the holders, M′, N′, O′, P′, and Q′, which are supported on the sleeve, R, of insulating material through which extends the rod, S. Each of the brushes M, N, O, P, and Q, are held against the surface of the transmuting cylinder by the spiral springs, *m*, *n*, *o*, *p*, and *q*.

T, is a short circuiting brush which is supported in the holder, U, which is pivoted on the spindle, *u*, journaled in the lugs, *v*, of the sleeve, V.

s, is an annular groove made in the rod, S, having a worm, *s′*, cut in it.

W, is an adjusting screw extending through the hole in the sleeve, V, and meshing with the worm, *s′*. The insulating sleeve, R, sur-

rounding the rod, S, is cut away as indicated in Fig. 2, so as to allow of the adjustment of the sleeve, V. This adjusting screw is designed to circularly adjust the sleeve, V, upon the rod, S, so as to readily alter the position of the brush upon the cylinder. The brush is held against the cylinder by the pressure of the spiral spring, u', on the spindle, u, one end of which spiral spring comes forward of the holder as shown.

X, is a pinion secured on the spindle, A, on the opposite end to that in which the motor is situated and Y, is a starting wheel which is provided with notches, y, on the face of the rim and jaws y', on the periphery of the rim.

Z, is a lever pivoted on the inclined stud, 2, on which the starting wheel, Y, is journaled. The handle, Z', of the lever, Z, is pivoted at z', on the end of the lever and has a dog-shaped end, z, which is designed to fit in between the jaws, y', when it is designed to rotate the starting wheel.

3, is a spring which is secured on the lever, Z, one end of which presses against the back of the handle, 2', so as to hold the dog, z, in between the notch, y'.

4, is a knife secured beneath the lever, Z, and designed to be brought around beneath the spring fingers, 5, and 6, of the switch, 7, from the position shown in dotted lines. The knife, 4, is insulated from the lever, Z, by the insulating plate, 4'.

8, is a ratchet wheel secured on the top of the stud, 2, and 9, is a dog pivoted on the starting wheel, Y, and held against the teeth of the ratchet wheel, 8, by the springs, 10. The starting wheel, Y, and lever, Z, are loose on the stud. It will consequently be seen that when the lever, Z, is brought from the position shown in dotted lines to the position shown in full lines that the starting wheel will be partially rotated and that the dog, 9, will prevent any possibility of the starting wheel being rotated in the opposite direction when the lever is brought back into the position shown in dotted lines.

When the starting lever is brought around so as to start the machine the pinion, X, comes opposite to one of the notches, y, and is thus prevented from being frictionally affected by the starting wheel when the transmuting cylinder is being driven by the motor.

Having now described the principal parts of my instrument I shall describe the wiring.

11, and 12, are the wires leading from the alternating current generator to the binding posts, 13, and 14.

11', is a wire leading to the vertical post, G, from which the current passes through the brushes, commutator and armatures of the motor out on the wire, 12', which connects with the wire, 12. The wire, 11, leads from the binding post, 13, to the binding screw 15, which extends into the spring finger, 6, of the switch, 7. The wire, 11, is continued from the binding screw, 16, which extends into the spring finger, 5, of the switch, 7, and leads by the branch wires, 11^2, 11^3, to the brushes, M, and Q, to the back of which they are secured by the sockets as shown.

17, is a wire leading from the central brush, O, to the wire, 12, which is a continuation from the supplemental wire, 12'.

18, is a wire leading from the brush, N, to the binding post, 19, thence to the motor.

20, is a wire leading from the brush, P, to the binding post, 21, thence to the motor.

22, is a wire connected to and leading from the wire, 20, to and through the lamp, 23, and back by wire 22' to the end of the rod, S, in which it is secured by the binding screw, t.

The operation of my instrument is as follows: The alternating current passes through the wires, 11, and 12. To start the machine the lever, Z, is brought around from the position shown in dotted lines in Fig. 1, to the position shown in full lines carrying with it by means of the dog z, fitting into the jaw, y', the starting wheel, Y. The peripheral face of the rim of this starting wheel acting upon the pinion, X, will cause it to rotate very quickly and at the same time will throw the knife, 4, into connection with the spring fingers, 5, and 6, of the switch, 7, which will complete the circuit of the wire, 11, through the switch. We will suppose that the current now passes through the wire 11, in the direction indicated by the arrow through the switch, 7, to the brushes, M, and Q. In the position in which the transmuting cylinder is shown in the drawings the brush, Q, will be idle as it rests upon the ring, L, which is separated from the central ring, K, by the insulating strip, n. The current will, therefore, pass through the brush, M, strip, J, lateral projection, j, up through the brush, N, and down along the wire, 18, to the binding post, 19, to and through the motor and back by the wire, 20. This of course will be a continuous current so as to drive the motor and will pass in the direction indicated by the arrow over the wire. The current will pass back from the binding post, 21, along the wire, 20, to the brush, P, down through the projection, k', of the ring, K, and up through the central brush, O, thence along through the wire 17, to the wire, 12, and back to the generator. We will now suppose that the direction of the current is changed and that it passes through the wire, 12, through the wire, 17, into the central brush, O, and as the position of the rings have been changed so as to move the lateral projections of the rings, L, K, and L, into the position shown in dotted lines, it will be seen that the current coming through the brush, O, will pass out through the brush, N, down the wire from O, in the direction indicated by the arrow—that is, the same direction as before out through the wire, 18, through the motor and back through the wire 20, in the same direction, to the binding post, 21, thence up through the wire, 20, to the brush, P, and down through the brush, P, to the projection, l, and out through the ring, L, and brush, Q, to the wire,

11, through which it passes out in the opposite direction to that indicated by the arrow. It will consequently be seen that the current running through the motor will be always in the direction indicated by the arrow and therefore be constant or continual while the current will alternate over the wires, 11, and 12, such alternations being changed into the constant current passing over the wires, 18, and 20, through the motor by the peculiar construction of the rings, J, K, and L. The continual alternations of the current will take place as the cylinder is revolved by the motor and the current will be transmuted through the brushes as hereinbefore described.

It will be noticed in starting my machine that the starting wheel, Y, will cause the spindle, A, to revolve faster than the alternations of current but immediately upon the current being thrown on the speed will be reduced so that my transmuter will keep pace with the alternations of current from the generator.

In order to provide against the sparking of the brushes, N, and P, I provide as before described a supplemental brush, T, which is designed to short-circuit the wires, 18, and 20, leading to the motor. The brush, T, is so arranged that it will reach the following projection, *j*, before the brush, N, has left the preceding projection, *j*, of the ring, J, or the succeeding projection, *k*, of the ring, K, before the brush has left the preceding projection, *k*, as the case may be, this of course depending on the direction of the current or alternations, so that when the brush, N, is passing over the insulating strip, *m*, the current instead of passing through the brush, N, from the brush, M, will, when it comes in on the wire, 11, pass through the wire, 11^2, to the brush, M, ring, J, projection, *j*, out on the brush, T, holder, U, sleeve, V, adjusting screw, W, rod, S, wire, 22, through the lamp, 23, back by the wires, 22, and 20, to the brush, P, through the projection, *k'*, ring, K, to the brush, O, and out on the wire, 17, to the wire, 12.

If the current is coming in on the wire, 12, and the transmuting cylinder has passed around so as to bring the projection, *k*, of the ring, K, underneath the brush, N, and the projection, *k'*, of the ring, K, underneath the brush, P, it will be seen that the current will then be short circuited through the wire, 12, wire, 17, brush, O, ring, K, succeeding projection, *k*, brush, T, holder, U, sleeve, V, adjusting screw, W, rod, S, wire, 22, passing through the lamp, 23, back on the wire, 22', to the brush, P, down through the brush, P, to the projection, *l*, of the ring, L, through the ring, L, and out through the brush, Q, wire, 11', and wire, 11.

From this description it will be seen that I have provided an instrument in which an extremely large voltage may be carried on a small wire from a generator many miles away by an alternating current and the current transmuted at the point where it is desired to be used from an alternating current to a constant or continuous current.

Although I show a short circuiting brush, T, it will of course be understood that it will be unnecessary to provide such a brush if the counter electro-motive force passing through the motor is sufficient to prevent sparking, but I prefer to provide the brush, T, as shown and described.

What I claim as my invention is—

1. The combination with a motor adapted to be run by an alternating current, of a transmuting cylinder formed of three rings insulated from each other and from the central spindle on which is located the motor and cylinder and having rectangular, tooth-shaped lateral projections alternately arranged and designed to fit into the spaces between the lateral projections of the adjacent ring and means whereby the alternating current is conveyed to the rings and transmuted to a constant current to be conveyed away from the rings as and for the purpose specified.

2. The combination with the motor having the armature and commutator located on the spindle, A, and driven through the alternating current wires as specified, of the transmuting cylinder comprised of the three rings, J, K, and, L, insulated from the spindle, A, by the insulating cylinder, I, and having rectangular tooth-shaped, lateral projections, the projections, *j*, extending into the spaces between the projections, *k*, of the ring, K, and the projections, *l*, of the ring, L, extending between the projections, *k'*, of the ring, K, and the projections, *k*, of the ring, K, extending between the projections, *j*, of the ring, J, and the projections, *k'*, of the ring, K, extending between the projections, *l*, of the ring, L, so as to form rectangular fret-shaped insulating spaces, *m*, and, *n*, between the ring, K, and the rings, J, and, L, respectively, of the brushes, M, N, O, P, Q, and means whereby the alternating current entering the brushes is transmuted by the cylinder comprised of the rings, J, K, and, L, as described and conveyed from the brushes as constant current as and for the purpose specified.

3. The combination with the motor having the armature and commutator located on the spindle, A, and driven through the alternating current wires as specified, of the transmuting cylinder comprised of the three rings, J, K, and, L, insulated from the spindle, A, by the insulating cylinder, I, and having rectangular tooth-shaped lateral projections, the projections, *j*, extending into the spaces between the projections, *k*, of the ring, K, and the projections, *l*, of the ring, L, extending between the projections, *k'* of the ring, K, and the projections, *k*, of the ring, K, extending between the projections, *j*, of the ring, J, and the projections, *k'*, of the ring, K, extending between the projections, *l*, of the ring, L, so as to form rectangular fret-shaped insulating spaces, *m*, and, *n*, between the ring, K,

and the rings, J, and, L, respectively, of the brushes, M, N, O, P, Q, and the alternating current wires, 11, and, 12, the wire, 11, being connected to the brushes, M, and, Q, so that when the current passes over the wires, 11, in the direction indicated and the brushes, N, and, P, are on the projections, j, and, k', the current will pass through the wire, 11, wire, 11^2, brush, M, ring, J, projection, j, brush, N, over the wires, 18, and, 20, in the direction indicated, back to the brush, P, through the projection, k', ring, K, brush, O, wire, 17, to the wire, 12, but when the current is passing over the wire, 12, in the direction indicated and the brushes, N, and, P, are on the projections, k, and, l, of the rings, K, and, L, respectively the current will pass over the wire, 12, in the direction indicated wire, 17, through the brush, O, ring, K, brush, N, through the wires, 18, and, 20, in the same direction as before, back to the brush, P, through the projection, l, ring, L, brush, Q, out on the wire, $11'$, and wire, 11, in the opposite direction as and for the purpose specified.

4. The combination with the alternating current wires 11, and, 12, designed to convey the current through the brushes, M, N, O, P, Q, and cylinder and wires, 18, and, 20, as specified, of the short circuiting brush, T, arranged to come in contact with the succeeding projection as the brush, N, leaves the preceding projection of the same ring, the brush, T, being connected by a short circuiting wire to a substance of low resistance and finally passing out through the brushes into one of the alternating current wires as and for the purpose specified.

5. The combination with the alternating current wires, 11, and 12, designed to convey the current through the brushes, M, N, O, P, Q, and cylinder and wires, 18, and, 20, as specified, of the short-circuiting brush, T, arranged to come in contact with the succeeding projection as the brush, N, leaves the preceding projection of the same ring, the brush, T, being connected through the holder, U, sleeve, V, adjusting screw, W, rod, S, wire, 22, lamp, 23, brush, P, projection, k', ring, K, brush, O, wire, 17, and wire, 12, and alternately in the opposite direction through the wire, 12, wire, 17, brush, O, brush, T, holder, U, sleeve, V, adjusting screw, W, rod, S, wire 22, lamp, 23, wire, 22, brush, P, projection, l, ring, L, brush, Q, wire, 11^2, and wire, 11, as and for the purpose specified.

6. The combination with the transmuting cylinder comprised of the rings, J, K, and, L, having the lateral projections, j, k, and, k' and, l, and the brushes, M, N, O, P, Q, arranged as to the alternating current wires and constant current wires as specified and the alternating current motor, of the pinion, X, and means whereby this pinion is partially rotated to start the transmuting cylinder and at the same time throw into circuit the alternating current wires to the brushes, as and for the purpose specified.

7. The combination with the transmuting cylinder comprised of the rings, J, K, and, L, having the lateral projections, j, k, and, k', and, l, and the brushes, M, N, O, P, Q, arranged as to the alternating current wires and constant current wires as specified and the alternating current motor, of the pinion, X, and starting wheel, Y, having the notches, y, cut in the face of the periphery of the lever, Z, and designed to partially rotate the starting wheel, Y, and cause the pinion, X, to revolve as and for the purpose specified.

8. The combination with the transmuting cylinder comprised of the rings, J, K, and, L, having the lateral projections, j, k, and, k', and, l, and the brushes, M, N, O, P, Q, arranged as to the alternating current wires and constant current wires as specified and the alternating current motor, of the pinion, X, and starting wheel, Y, having the notches, y, cut in the face of the periphery of the lever, Z, and designed to partially rotate the starting wheel, Y, and cause the pinion, X, to revolve and at the same time bring the knife 4, beneath the spring fingers, 5, and, 6, of the switch, 7, so as to complete the circuit through the wire, 11, as and for the purpose specified.

9. The combination with the transmuting cylinder comprised of the ring, J, K, and, L, having the lateral projections, j, k, and, k', and, l, and the brushes, M, N, O, P, Q, arranged as to the alternating current wires and constant current wires as specified and the alternating current motor, of the pinion, X, and starting wheel, Y, having the notches, y, cut in the face of the periphery of the lever, Z, which is provided with a pivoted handle, H, designed to fit in between the jaws, y', and partially rotate the wheel and the spring dog, 9, designed to come in contact with the ratchet wheel, 8, secured to the stud, 2, as and for the purpose specified.

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Witnesses:
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